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ABSTRACT

The benefits accrued through the use of triangulation as both a design strategy and an analytic tool cannot be overstated. Triangulation allows for the clustering and organizing of disparate yet related data. Finding out what the data have in common and how the data are different allow the researcher to eliminate (or reduce) the number of plausible rival hypotheses which might explain such data. Triangulation was applied in an evaluation of a community education (CE) program in Kanawha County (KC), West Virginia. Interviews and questionnaires were constructed to gather information relative to the following questions: (1) How successful is the program in KC in achieving its outcomes? (2) How effective is the program in KC in providing services? (3) How efficient is the program in KC in delivering services? (4) What are the major strengths and weaknesses of the program in KC? and (5) What difference has the CE program in KC made in the lives of the residents? Information was collected from CE staff, school faculties, school administration members, community residents, community agency officials, and school-age children. Two methodological approaches, descriptive and case, were used in the operationalization of the evaluation. (RL)

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OPERATIONALIZING TRIANGULATION IN NATURALISTIC EVALUATION: COMMUNITY EDUCATION IN KANAWHA COUNTY (WVA)

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Remember discussions about "perception," particularly figure-ground and optical illusion topics? You might have been asked to look at a picture and describe what you saw. Then, remember how you stated that you saw a goblet or chalice in the picture and the researcher/discussant asked you to blink and to look again at the picture and describe what you saw? This second time you might have reported seeing a different pattern--two silhouettes (of facial profiles) facing each other--in that same picture. Describing triangulation creates a situation which parallels the goblet-faces one. And just as with viewing the picture above, what is used and known about triangulation differs depending on who you read and/or to whom you listen.

The purpose of this paper is fourfold. First, ways of seeing and knowing about triangulation are discussed in definitional and conceptual terms from an historical perspective. Second, operational types of triangulation are discussed. Third, the operationalization of triangulation through an evaluation study of a community education (CE) program is described. Finally, implications for the future application of triangulation principles and use in the conduct of inquiry in educational situations are drawn.

Definitional and Conceptual Boundaries

Methods of naturalistic inquiry (N/I) appropriate for use in researching problems in educational situations have become widely known within the past five years (Greenfield, 1977; Guba, 1978; Guba, 1980; Rist, 1980). Most of the "new knowledge," however, is not "new," but has been discussed more at a conceptual level than at an operational one. This has placed many researchers and evaluators in the position of using N/I strategies and techniques without having the benefit of practical examples from which they can model or with which they can agree or disagree. One such technique is triangulation.

Using Patton (1980) as a current resource on the topic of triangulation, one sees the term discussed in two contexts: design--as in mixing qualitative and quantitative methodologies; and data analysis--as in validation and verification,

reconciling qualitative and quantitative data. Guba (1978) also sees triangulation as a tool useful in the corroboration of data. Quickly, one also sees that the triangulation "guru" appears to be N. K. Denzin, writing in the early 1970s (1971; 1970(a); 1970(b)); in fact, Patton (1980) elaborates on the definitions and types of triangulation using Denzin almost to the exclusion of any other source. It is Denzin (1971) who sees triangulation as a technique which

> forces the observer to combine multiple data sources, research methods, and theoretical schemes in the inspection and analysis of behavioral specimens. It forces him to <u>situationally</u> check the validity of his causal propositions...and to <u>temporarily</u> specify the character of his hypothesis (p. 177).

Multiple triangulation involves the use of more than one type of triangulation: data and/or investigators and/or theories and/or methodologies. Denzin (1970(a)) explains all four types. In data triangulation, a researcher gathers observations using multiple sampling strategies. For example, he or she can sample observations based on time, on persons, on situations. Investigator triangulation implies the use of more than one observer. [See Campbell (1975) and Campbell (1964) for a discussion of the use of data and investigator triangulation as a guide for conducting multiple ethnographies in order to extricate the own-culture bias of the researcher from the study-culture content under investigation.] Theory triangulation involves the use of several conceptual frameworks in analyzing the same data set; however, the use of different theoretical perspectives is not intended to be a canceling out of views but is intended to be an assurance that a theoretical framework is used in the study. The fourth type of triangulation, methodological, posits the use of more than one method (e.g., qualitative and quantitative; interview and survey; document analysis and interview) as well as more than one instrument within a method, such as the use of three different scales to measure the same construct.

Although Denzin (1970) initiates discussion of triangulation as a technique which can help a researcher deal with the problem of having only one measurement

class, it is Webb, Campbell, Schwartz, and Sechrest (1966) to whom the idea of methodological triangulation is attributed. Writing about the use of non-reactive measures, they promote the use of multiple methods (multiple operationism) which do not share the same sources of bias. Triangulation (methodological), therefore, helps control irrelevancies.

> Once a proposition has been confirmed by two or more independent measurement processes, the uncertainty of its interpretation is greatly reduced. The most persuasive evidence comes through a triangulation of measurement processes (p. 3).

Again, although Webb, et al (1966) are cited by Denzin (1970(a)) regarding methodological triangulation, Campbell and Fiske (1959) continue to be viewed as the "granddaddies" of the triangulation concept through their famous article on multitrait-multimethod means of establishing convergent and discriminant validation. They developed a mathematical model for the validation process which is based on rules about the intercorrelations among tests assessing at least two traits utilizing at least two methods. Such a model might be seen as an extension of the leadership study work done by Campbell (1956) in which he speaks of having used "what might be called methodological triangulation, in that several different methodological approaches have been employed to get at the same variable." (p. 73). He saw this triangulation notion as being similar to criterion-related validity, "taking several of the operations seemingly appropriate to the genus and checking these against each other." (p.74)

From the Campbell and Fiske (1959) article, the search for the "ultimate" basis of this notion of triangulation began. How did this idea, supposedly rooted in trigonometry/Euclidean geometry, get into the social science and research literature? Through whom--whose thinking propelled the use of a mathematical model analogy for these issues? We believe the answer rests with Feigl (1967). Having begun his studies in 1922, Feigl's contacts have included Wittgenstein, Karl Popper, S. S. Stevens, E. C. Tolman, B. F. Skinner, and R. Carnap. In the essay in which he examines the extent to which mental

states ("raw feels," introspection) may be in one-to-one correspondence with neurophysiological (behavioral) conditions, he gets to the root of the advantage of triangulation: "Scientists are predominantly interested in enlarging the scope of predictive explanations...It is part of the methodology...that prediction...is always in principle possible starting from intersubjectively confirmable statements..." (p. 17) And Feigl does see this intersubjective confirmation as being possible with all scientific concepts. For such concepts to be included under the rubric of "empirical science," they would have to be "fixed" by "triangulation in logical space." (Feigl, 1967, p. 17) thus,

> ...the system of scientific concepts and laws may be 'tacked down' in a variety of alternative ways, either in several sense modalities, (as in the normal case), or even in only one of them. To be sure, 'triangulation of entities in logical space' is much easier and much more secure in the normal case (p. 66).

It is the philosophy of science perspective explicated by Feigl from which the origins of triangulation seem to come. His thought can probably then be linked to the mathematical bases. Given this historical/conceptual perspective, what kinds of operational characteristics exist for triangulation?

Operational Types

In utilizing Denzin's broad categories describing types of triangulation--data, investigator, theory, methodology--we operationalized various levels and principles by which he saw each type. Our use of his descriptors, however, was integrated into a general design framework for the study which did not make such a classification explicit; the matrix of taxonomic categories for various triangulation principles and procedures for data collection served as an underlying "conceptual framework" for the study.

Taxonomically, data triangulation has different levels and types (Denzin, 1970(a), pp. 301-312). Types include time, space, and person; levels include the individual, individuals in interaction, and the collectivity. Investigator triangulation involves multiple (versus single) observers of the same object.

Theory triangulation uses three types of multiple perspectives: self-generated propositions; literature and research principles; and secondary/interpretive/critique sources. The fourth type of triangulation, methodological, utilizes three guiding principles regarding the two types involved. The three principles focus on: (1) relevance of the various methods used to the problem/issue/concern under study; (2) combination of the various methods seek to reduce threats to internal and external validity; and (3) relevance of the various methods used to the "status" of the theoretical propositions--stable patterning, statis propositions versus dynamic, interactive propositions. The two types of triangulation methodologically center: (1) on viewing observational units as multidimensional, whereby the researcher employs multiple strategies within the same method; (2) where the researcher uses dissimilar methods to assess the same observational unit.

Again, the benefits accrued through the use of triangulation as both a design strategy and an analytic tool cannot be overstated. Triangulation allows for the clustering and organizing of disparate yet related data. Finding out what the data have in common and how the data are different allow the researcher to eliminate (or, at least, reduce) the number of plausible rival hypotheses which might explain such data.

Application in an Evaluation of a Community Education Program

Several methods or techniques for data collection were employed. Three sources of data, considered unobtrusive measures, were tapped: archives--the running record; archives--the episodic and private record; and simple observation (Webb, et al., 1966). Interviews and questionnaires were constructed to gather information relative to the evaluation question. This "triangulation" (Patton, 1980) through the use of different methodologies, measures, investigators, and sources, allows both intensive investigation of the program--through a case study design, for example, which may focus on participant observation of pivotal processes or parameters at one center--and comparative investigations

across centers. In addition, the use of multiple triangulation, assured the best evaluation possible under the given constraints of limited resources (temporal, financial, personnel).

Five specific questions formed the focus for the evaluation:

1. How successful is the program in Kanawha County in achieving its outcomes?
2. How effective is the program in Kanawha County in providing services?
3. How efficient is the program in Kanawha County in delivering services?
4. What are the major strengths and weaknesses of the program in Kanawha County?
5. What difference has the CE Program in Kanawha County made in the lives of the residents?

Data Sources

A number of different populations were identified from which information about the Community Education program (CE) in Kanawha County were collected: CE staff, school faculties; school administration members; community residents; community agency officials; and school-age children. The evaluation team felt that these groups could be assessed initially. Other populations (e.g., senior citizens, handicapped individuals) might need to be tapped as part of future evaluations.

The deicsion-making process which was used by the evaluation team to choose one population over another centered on feasibility and communication. Those populations whose views were seen as essential to a credible evaluation were listed. The largest possible and most reasonable definition for a stratum of people was used. So, for example, community residents were chosen as a population, not handicapped citizens or senior citizens. Once these strata were chosen, the use of communication flow as a filter became necessary. Thus, a population/sample decision model (see Figure 1) was used similar to the flow of information through the CE system, at least hierarchically. People at each level within the

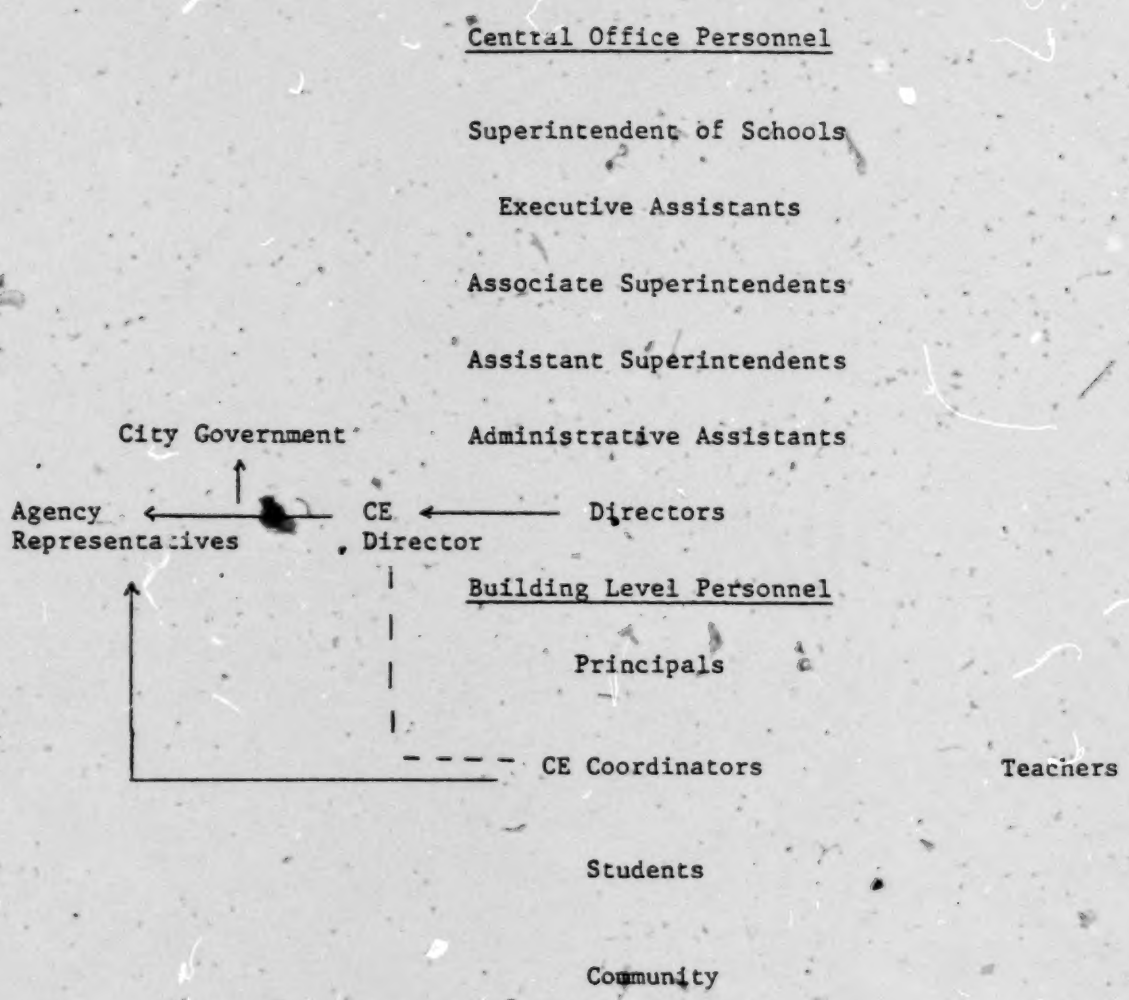

Figure 1

Decision model for choosing populations/samples

hierarchy served as data sources for this evaluation.

Methods

Two methodological approaches were used in the operationalization of the evaluation: descriptive and case. For the descriptive approach, interview schedules and questionnaires were used for data collection purposes. Interview schedules also were used as part of the case approach. There, though, the major source of information was unobtrusive measures, primarily records and observation.

DESCRIPTIVE

Four interview schedules were constructed to gather information. Utilizing the program design as the foundation, questions were generated to be asked to CE coordinators, school administration members, community residents, and agency officials. The questions reflect information needs about the CE program (to be gathered from many sources): the community in which the CE center operates--history, norms, culture, values, SES; the role of coordinators--expectations of the community (and vice versa), plans or visions for the center; the advisory councils--participation, decision-making powers, agendas dealt with, goal setting; the degree to which council members feel they (and their center) are attaining outcomes and impacts (results); and the strengths and weaknesses of the program's dimensions.

Four surveys were developed based on the program design and were administered to 3,415 people as part of the evaluation plan. Four main parts comprised the questionnaire. The first section was devoted to the collection of demographic type information. In the second section, respondents indicated their reactions to questions related to their knowledge of, interest in, participation in, and attitudes toward the CE program. A third section asked respondents to indicate the extent of change in 25 areas which they perceive has resulted from the implementation of the CE program. The fourth section specifically requested respondents to indicate the extent of operation of a CE program which would occur if school system funding was removed.

CASE.

An effort to build a partial history and background for this evaluation was attempted in order to provide a context into which readers could place the CE program. The effort is toward a "partial" history and background because only two major data sources were used: the files maintained by the CE director; and the CE director, herself. A three-step procedure characterized the collection of documentation. First, all available records were identified. Second, file drawers and notebooks with the information were perused; notes were taken about the material. Third, all information was arranged chronologically by CE Center.

The bulk of the data for the case was collected through five field visits which ranged from three to five days each. Thus, the investigator found it necessary to establish relationships during short but concentrated periods. Time during each field visit was spent conducting formal and information interviews examining documentation in the CE Center's files and at the central office, and driving through the service region of the center and other parts of Kanawha County. The investigator talked informally with teachers, students, GW High School staff members, and many people either who worked at GW or who came to participate in the CE program. Also, the investigator attended meetings with DW and spent a lot of time "hanging around" GW observing, listening, and watching for clues as to how CE was operating there.

Theory

Several sources served as the basis for the Kanawha County evaluation plan. Specific CE evaluation plans, studies, and literature were examined. Models appropriate for application towards a program evaluation were reviewed. It was the program design created (Schwartz and Kaplan, 1981) which served to guide the conceptualization of the plan, and then its implementation. As another step in preparing the evaluation plan, and in analyzing results, evaluation team members conducted several brainstorming sessions to review the literature collected on CE evaluation and to generate original questions. A number of the issues

raised were incorporated into the plan. Finally, before the evaluation plan was drafted, evaluation team members visited the county. The team members observed six CE centers; interviewed several coordinators and principals and the CE director; and met with the superintendent, the county advisory council, and members of the central office staff. Data from these conversations and observations were incorporated into the evaluation plan.

Investigators

Four investigators/evaluators became a "team" in the pursuit of this evaluation. Each person was assigned "primary" responsibility for one aspect of the evaluation, but was assigned areas of "secondary" and "tertiary" responsibility, too.

For example, all questionnaires and community resident interviews were analyzed using descriptive statistics. Two team members had been primarily responsible for these phases, and, thus, continued their responsibility through the data analysis and interpretation phases.

The investigators whose tasks centered on the production of an historical picture of the county CE program and a case study of one CE center both took extensive field notes. Being somewhat unmanageable due to their tremendous volume, these notes were organized by rereading them and beginning to classify them by topics. The principal investigator for the case had an outline which guided this sorting process, for example. In the analysis process, team members collated all the sorted data and information. This meant taking all the assembled raw data and condensing it by evaluating, classifying, and editing pieces.

Finally, two of the evaluators went back to the site to "feed back" information and results to program staff. There were areas of disagreement, of "multiple realities." Such areas of concern were included in the findings, where appropriate, were revised in the report, or were discarded after reaching a new level of understanding.

Future Uses

Triangulation would seem to help avoid solution orientation, the Kuhnian notion that the paradigm is taken for granted and what the researcher does is to become occupied with solving puzzles according to the rules of that paradigm. In this purpose, triangulation would go beyond its focus as a technique for corraboration and verification--a reactive or passive stance--and towards a focus as a technique for integration and synthesis--a proactive position.

Interestingly, factor analysis is a tool useful in the explanation and extension of the construct validity of some variables as well as in testing hypotheses which were generated apriori. Factor analysis determines

> the number and nature of the variables that underlie larger numbers of variables or measures. It tells the researcher, in effect, what tests or measures belong together--which ones virtually measure the same thing, in other words, and how much they do so (Kerlinger, 1979, p. 180).

Could triangulation be the qualitative analog of factor analysis? Given the underlying geometric relationship where a correlation coefficient can be seen as the cosine of the angle between two vectors of the same length and with the same origin and where factor vectors are referants which enable the researcher to determine interrelatedness among data, do the geometric underpinnings of triangulation connect meaningfully? "The science of finding (phenomena which show simultaneous and consistent variation under similar conditions) is, in a nutshell, the province of the factor analyst." (Child, 1970, p. 5(4))

> It is through triangulation of data procured from different measurement classes that the investigator can most effectively strip of plausibility rival explanations for his comparison.../ We suggest the...question: Which set of methods [as compared with single method] will be best? (Webb, et al., 1966, pp 174/175).

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